CHAPTER 8

LIST OF EFFECTIVE TEMPORARY REVISIONS

FOLLOWING IS A COMPLETE LISTING OF ALL ACTIVE TEMPORARY REVISIONS (TR'S). TR'S NOT LISTED SHOULD BE REMOVED. THE ATA NUMBER, CONFIG CODE AND PAGE NUMBER IDENTIFIES THE PAGE PRECEDING THE TR.

TR NUMBER	ATA NUMBER	CONFIG CODE	PAGE NUMBER	TR DATE
NONE				

CHAPTER 8

LEVELING AND WEIGHING

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CHAPTER 8

LEVELING AND WEIGHING

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LEVELING AND WEIGHING - DESCRIPTION AND OPERATION

1. General

The L-1011 aircraft must be operated within specific weight and balance limits to attain top efficiency. To assure that the weight conditions and center of gravity (CG) are accurately determined, the aircraft must be leveled and weighed. Normal mechanical methods should be employed for leveling, and any of several electronic weighing systems may be used to obtain the required weight data.

Procedures for leveling the aircraft are found in 8-10-00. Procedures for weighing the aircraft are described in 8-20-00.

LEVELING - DESCRIPTION AND OPERATION

1. General

The aircraft must be level during weighing operations. Three methods can be used to level the aircraft, based on use of the following equipment:

Plumb bob

Spirit level

Engineers transit

For general maintenance such as weighing the aircraft, gear retraction tests, or fuel calibration, either the plumb bob or spirit level method is used. For accurate alignment of the aircraft structure, the engineers transit method is required. Provisions are included in the left main landing gear wheel well for the use of the plumb bob. The plumb bob method indicates jacking movement (Ref. 8-11-00). Spirit levels, also located in the left main landing gear wheel well, indicate the longitudinal and lateral attitude of the aircraft (Ref. 8-12-00). By setting the level device (after loosening the locking wing nut) so that the spirit level bubble is in the center, the aircraft attitude can be read directly on the indicator plate. External leveling points are clearly marked on the aircraft structure and are to be used in conjunction with an engineers transit (Ref. 8-13-00).

LEVELING, PLUMB BOB - MAINTENANCE PRACTICES

R 1. Equipment and Materials

Plumb Bob Kit, PN 177B, L.S. Starrett Co., or equivalent

Landing Gear Downlock Safety Pins

2. Referenced Procedures

7-11-00 Wing and Fuselage Jacking - Maintenance Practices

R 10-10-00 Parking - Maintenance Practices

3. Maintenance Practices

R A. Leveling Instructions

(1) Park aircraft on level with sufficient head room for jacking. Install landing gear downlock safety pins and
R attach static ground cables (Ref. 10-10-00).

(2) Suspend plumb bob from a bracket located in left wheel well at BL 42.5. Bracket is directly above calibrated leveling grid scale that is attached to the structure (Ref. Fig. 201).

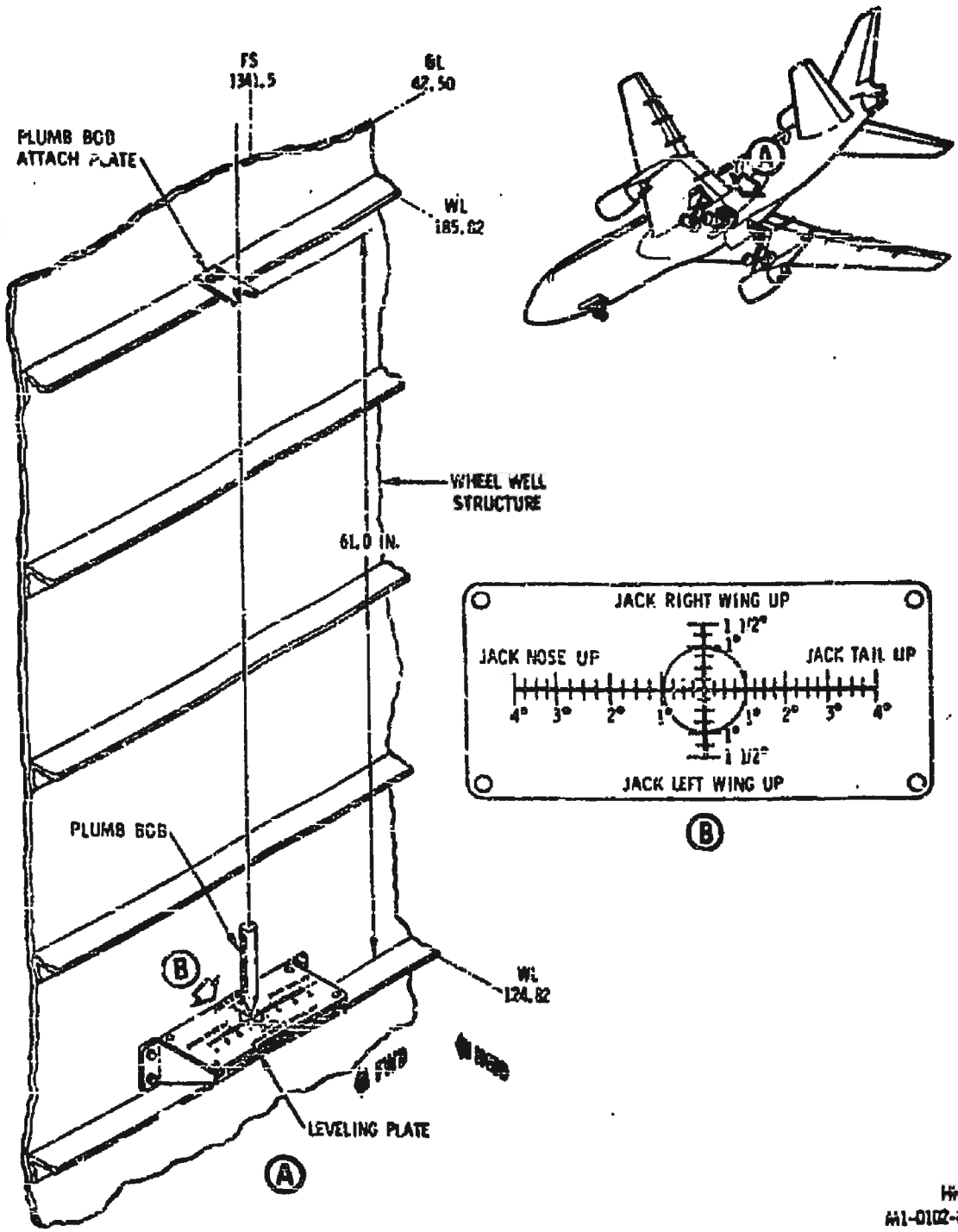
R NOTE: Jacking height is dependent on the operation
R which is to be performed. To level the
R aircraft, the wheels need not be raised off the
R deck.

R (3) Jack aircraft at wing and fuselage jack points as
R required (Ref. 7-11-00).

R (4) Check position of plumb bob after it has stopped
R swinging.

R (5) Raise or lower appropriate jack until plumb bob is centered over zero on calibrated grid scale.

(6) On completion of leveling, lower and remove jacks (Ref. 7-11-00).



Aircraft Leveling Using Plumb Bob
Figure 201

LEVELING, SPIRIT LEVEL - MAINTENANCE PRACTICES

R 1. Equipment and Materials

Landing Gear Downlock Safety Pins

2. Referenced Procedures

	7-11-00	Wing and Fuselage Jacking - Maintenance Practices
R	10-10-00	Parking - Maintenance Practices

3. Maintenance Practices

R A. Leveling Instructions

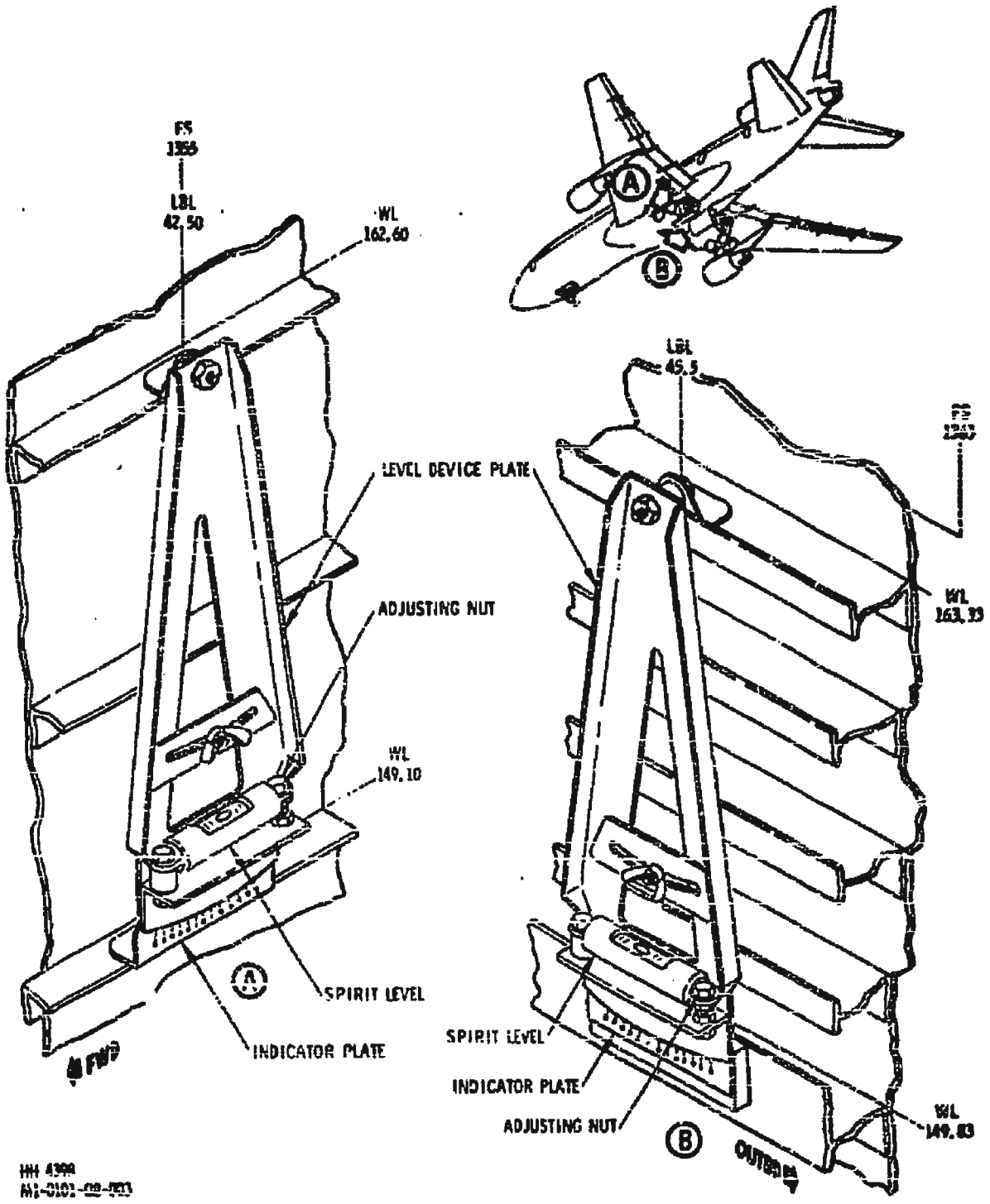
(1) Park aircraft on level with sufficient overhead clearance for jacking. Install landing gear downlock
R safety pins and attach static ground cables (Ref.
R 10-10-00).

R NOTE: Jacking height is dependent on the operation
R which is to be performed. To level the
R aircraft, the wheels need not be raised off the
R deck.

R (2) Jack aircraft at wing and fuselage jack points as
R required (Ref. 7-11-00).

R (3) Raise or lower appropriate jack for longitudinal and
R lateral leveling until spirit level bubbles are
R centered at zero positions (Ref. Fig. 201).

R (4) Lower jacks (Ref. 7-11-00).



Aircraft Leveling Using Spirit Level
Figure 201

LEVELING,1, ENGINEERS TRANSIT - MAINTENANCE PRACTICES

1. Equipment and Materials

Hydraulic Jack (100-ton capacity)

Hydraulic Jack (30-ton capacity)

Jack Pad Adapters

Plumb Bob Kit, PN 177B, L.S. Starrett Co., or equivalent

Engineers Transit, Model T-2, H. Wild Inst. Supply Co., or equivalent

Range Pole Set, Mahler Eng. Co., or equivalent

Scales, (graduated in 0.020-inch increments), L.S. Starrett Co., or equivalent

NLG Shock Strut Lock Assy, PN B708-101, or equivalent

MLG Shock Strut Lock Assy, PN 1504972-923-MST, or equivalent

Landing Gear Downlock Safety Pins

2. Referenced Procedures

7-11-00	Wing and Fuselage Jacking - Maintenance Practices
8-11-00	Leveling, Plumb Bob - Maintenance Practices
9-11-00	Towing - Maintenance Practices
10-10-00	Parking - Maintenance Practices

3. Maintenance Practices

A. Preparation of Aircraft for Leveling

R (1) Prior to parking aircraft, tow in straight line for a R least 15 feet to align landing gear and relieve R scrubbing loads (Ref. 9-11-00).

R (2) Aircraft must be parked away from air movement of over R 5 MPH.

R CAUTION: DO NOT JACK AIRCRAFT UNLESS LANDING GEAR DOWNLOCK
R SAFETY PINS ARE INSTALLED AND STATIC GROUND CABLES
R ARE CONNECTED (REF. 10-10-00).

R (3) Park aircraft on level with sufficient head room for
R jacking. Install landing gear down lock pins and
R attach static ground cables.

R (4) Remove or relocate onboard equipment to ensure that
R aircraft center of gravity is within acceptable limits.

R (5) Determine that maximum jacking weight of 340,000 pounds
R will not be exceeded (Ref. 7-11-00).

(6) Remove all personnel from aircraft while leveling measurements are being taken.

B. Jack Aircraft

NOTE: Refer to 7-11-00.

(1) Remove all support equipment from aircraft structure.

(2) Insure that landing gear shock struts are bottomed out or are in locked position.

(3) Install plumb bob in left wheel well (Ref. 8-11-00).

C. Level the Aircraft Laterally

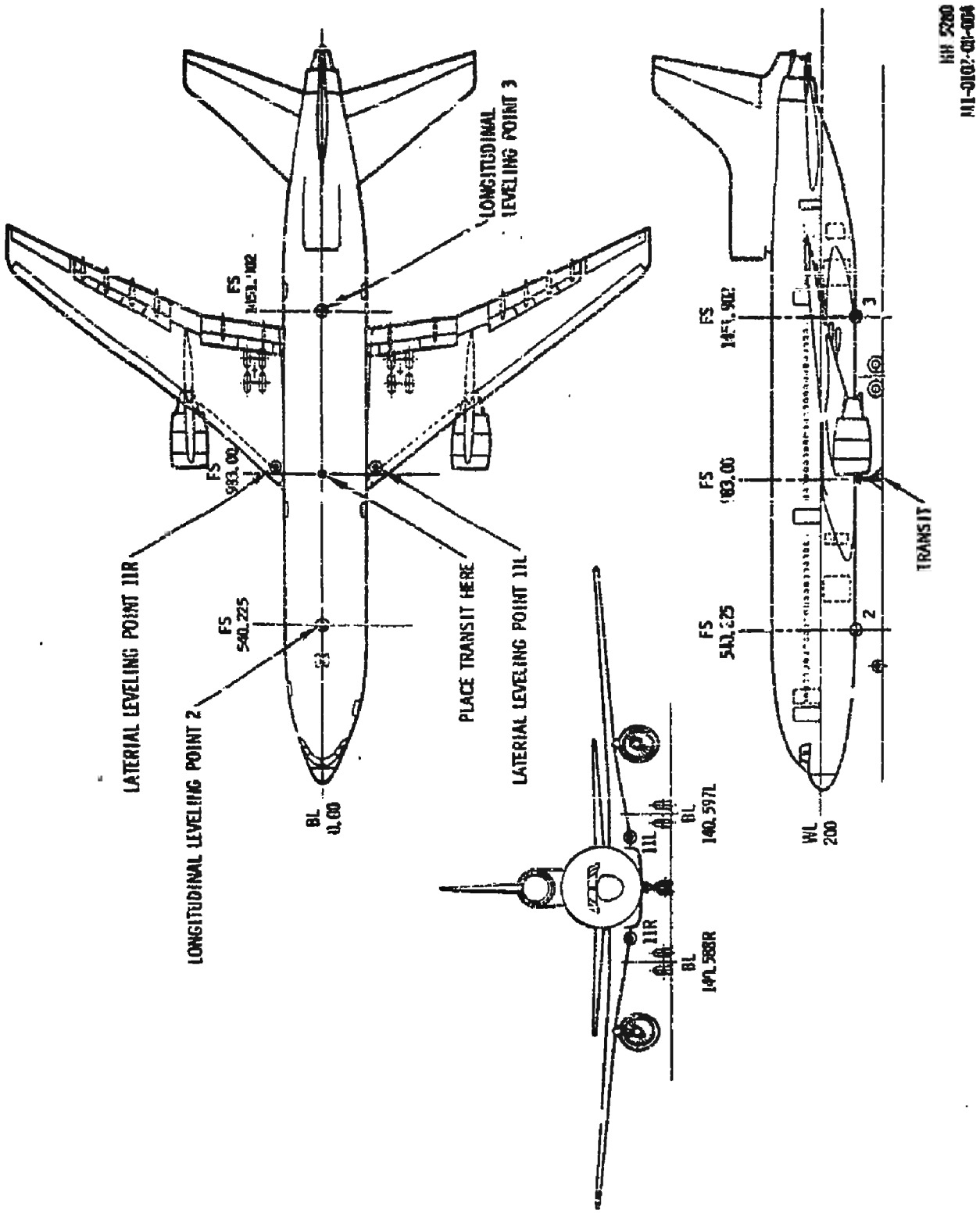
NOTE: Wing jacks should be operated manually and singularly to provide small vertical adjustments as required.

CAUTION: DO NOT JACK A SINGLE WING JACK MORE THAN TWO INCHES TO PREVENT EXCEEDING THE BALL AND SOCKET ACTION TRAVEL OF THE JACK RAM ADAPTER TO WING JACK ADAPTER PAD.

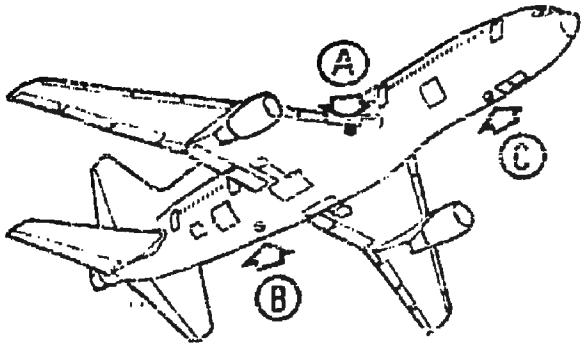
(1) Place engineers transit directly under center line of aircraft at FS 983.00. This location allows sighting on range poles or scales at reference points 11L and 11R (Ref. Fig. 201).

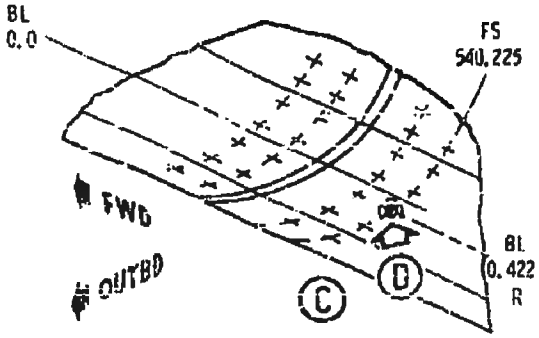
NOTE: Range poles or scales of 8 feet in length are required to contact the reference points on the aircraft. If range poles are used, the ball end should contact recess in reference point fastener head.

(2) Take readings on range pole or scale at each reference point to determine degree of level or unlevel attitude.

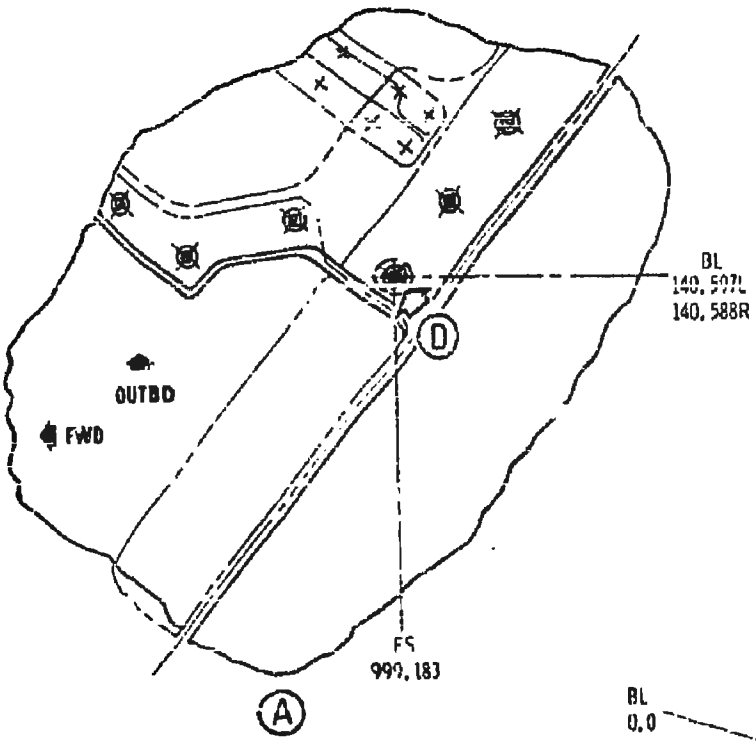


Transit Leveling Points
Figure 201 (Sheet 1)

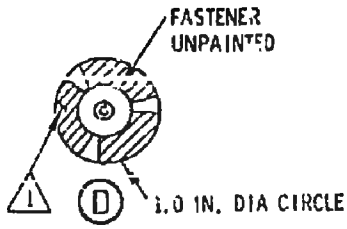




LONGITUDINAL LEVELING POINT 2

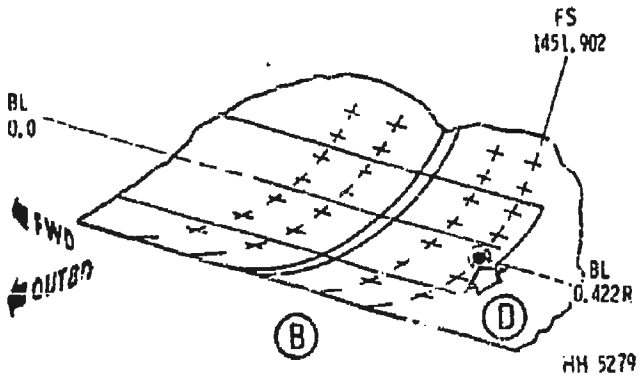


LEVELING POINTS 11L AND 11R



LEVELING POINT IDENTIFICATION

1 RED PAINT



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LONGITUDINAL LEVELING POINT 3

R Transit Leveling Points
R Figure 201 (Sheet 2)

EFFECTIVITY: ALL

050

(3) Adjust wing jacks so scale readings of points 11L and 11R are in the same horizontal plane. When this is attained aircraft is considered to be level laterally.

D. Level the Aircraft Longitudinally

(1) Take a sighting on range pole or scale at fore and aft reference points 2 and 3 to determine amount fuselage is level or unlevel (Ref. Fig. 201).

(2) Adjust fuselage jack so that range pole or scale reading of fore and aft reference points 2 and 3 are in the same horizontal plane. When this is completed aircraft is level longitudinally.

E. Final Level Check

(1) Adjust wing jacks if required by additional transit readings, to ensure that points 11L and 11R are in the same horizontal plane. Adjust nose jack so that reference points 2 and 3 are in the same horizontal plane.

(2) Take and record lateral and longitudinal values of plumb bob relative to scale zero point (Ref. 8-11-00, Fig. 201).

(3) Remove all stands and equipment from the aircraft.

(4) Lower aircraft in accordance with jacking instructions (Ref. 7-11-00).

WEIGHING - DESCRIPTION AND OPERATION

1. General

CR Three different procedures for weighing the aircraft may be used:

Electronic portable platform aircraft weighing system

Electronic load cells mounted on jacks at the nose and main gear axle jacking points

R Electronic load cells at the fuselage and wing jacking points (Load Cells incorporated into jack rams at wing jack points)

AIRCRAFT WEIGHING PREPARATION - MAINTENANCE PRACTICES

1. General

The following instructions are provided to prepare the aircraft for weighing. Any deviations, other than normal, should be noted on the Aircraft Weighing Check List, M11-08-04/-05, which is to be used in calculating the basic empty weight from the as-weighed condition.

2. Weighing Facilities

A. Facilities should include a closeable hangar that will:

(1) Exclude all wind and drafts and be free of strong air current.

(2) Permit shutdown of any fans that cause air currents while weighing (actual reading of scales).

(3) Maintain relatively constant temperature.

(4) Provide a level weighing floor and sufficient head room.

3. Weighing Check List

A. The condition of the aircraft at weighing will be recorded on the Weighing Check List M11-08-04/05. Any possible discrepancies will be noted. Quantities of items identified on the check list will be written in the spaces provided.

4. Referenced Procedures

7-11-00	Wing and Fuselage Jacking - Maintenance Practices
28-22-00	Defueling System - Maintenance Practices

5. Maintenance Practices

A. Fuel System

(1) Level the aircraft per MM 8-10-00.

CR (2) Drain fuel to the unusable fuel level. Defuel the
CR aircraft at the single point fueling and defueling
CR fitting in accordance with normal defueling practice.

NOTE: Unusable fuel is the quantity remaining aboard after the tanks have drained at the sumps and
CR surge box drain valves with the aircraft level.

CR (3) Ensure the aircraft is level per MM 8-10-00.

B. Engine, Integrated Drive Generator, and APU Oil

CR (1) Fill tanks and systems to capacity.

C. Miscellaneous Oil and Fluid

(1) Check these items for the following conditions before weighing:

(a) All hydraulic oil reservoirs filled to normal capacity

(b) Landing gear shock struts oil filled to normal capacity

(c) Air conditioning air cycle machines and engine starter oil filled to normal capacities

(d) Washing and potable water tanks drained (system lines not included)

CR (e) Chemical lavatory fluids drained.

D. Miscellaneous System

(1) Check these items for the following conditions before weighing:

(a) Air is bled from nose and main gear shock struts to permit installation of strut locks if weighing is to be done with wing and fuselage jacks (Ref. 7-11-00)

(b) Flight Station oxygen system and fire extinguisher bottles completely charged

(c) All landing gear tires properly inflated

(d) Flaps and spoilers retracted

(e) All control surfaces are in the neutral position

(f) All passenger and crew compartment interior furnishings are in normal position

(g) All galley and cabin service equipment removed

(h) Aircraft interior vacuumed

(i) All tools, working equipment, and trash removed

CR CR (j) All aircraft doors closed (main gear doors may be open).

(k) All cargo retaining nets stowed and number of cargo containers noted

CR CR (l) All emergency equipment will be installed per the applicable emergency equipment diagram.

CR (m) Clean and dry the aircraft thoroughly.

CR (n) Ground the aircraft.

CR (o) Install the landing gear pins.

WEIGHING PROCEDURE USING FLOOR LEVEL SCALES

1. Referenced Procedures

8-11-00 Leveling, Plumb Bob - Maintenance Practices

R 9-11-00 Normal Towing Conditions - Maintenance Practices

2. Servicing

CR A. General

CR It is mandatory that the platform scales be warmed up at
CR least 30 minutes prior to use.

CR B. Weighing

CR (1) Position aircraft on floor level scales so that each
CR wheel or each set of wheels is resting on center of
CR scale platform (Ref. 9-11-00).

CR (2) Remove aircraft from scales until aircraft is clear of
CR scale platform.

CR (3) Stabilize the platform scales for zero-load conditions.

CR (4) Position aircraft onto floor level scales so that each
CR wheel or set of wheels is resting on center of scale
CR platform.

CR (5) Level the aircraft attitude by inflating or deflating
CR the landing gear struts as required. Check aircraft
CR level attitude by the plumb bob method (Ref. 8-11-00).

(6) Record weight readings obtained from each aircraft weight reaction point, using the appropriate weighing form.

(7) Remove aircraft from scales.

(8) Check scales for zero-load condition.

CR (9) Record readings on Weighing Check List M11-08-04/-05.

CR (10) Repeat Steps 2B(4) through 2B(8) if the zero load on
CR any scale is greater than 100 lbs. Record both sets of
CR readings.

R R # WEIGHING PROCEDURE USING ELECTRONIC LOAD CELLS AT LANDING GEAR JACK POINTS

R 1. General

CR It is mandatory that the weighing kit be connected and warmed up CR for a minimum of two (2) hours prior to use. This warm up CR period is not required if the system has been shut off for a CR short period of time (approximately 30 minutes or less after the CR warm up period). The warm up period may be accomplished prior CR to programming the instrument. Care is required in the CR positioning of load cells to prevent side loads from being CR introduced.

R 2. Referenced Procedures

R 7-12-00 Axle Jacking - Maintenance Practices

R 8-11-00 Leveling, Plumb Bob - Maintenance Practices

CR 3. Setup

CR A. Open the system carrying cases and remove the load CR transducer assemblies and cables to be used in the weighing CR (handles are provided in the carrying case to handle the CR load transducer). Ensure that the handles are firmly locked CR in load cells. Inspect load transucers and cables for CR damage during transit: broken, bent, cracked, cut cables, CR or other visible damage. Report discrepancies to CR supervisor.

CR B. Place the load transducers into leveling jack heads (place CR the alignment pin at the bottom of the load transducer into CR the hole provided in the jack head). Place the jack and CR load transducer under the jack point of the aircraft.

CR C. Open the instrument case and inspect for damage during CR transit: broken, bent, cracked or other visible damage. CR Report discrepancies to supervisor.

CR D. Connect load transducer assemblies to the digital indicator CR via cabling provided (male connector to female connector). CR Any load cell can be connected to any channel.

CR E. Align load transducer weight receiving receptacle (ball CR socket) to approved jack point on aircraft to be weighed.

CR **WARNING:** IMPROPER ALIGNMENT OF LOAD TRANSDUCER OR IMPROPER
CR ALIGNMENT OF JACKS THEMSELVES WILL RESULT IN DAMAGE TO
CR AIRCRAFT AND POSSIBLE INJURY TO PERSONNEL.

CR F. Double check all load transducers and jacks for proper
CR deployment and firm contact with the ground. Also, the load
CR transducers have no load applied to them (load transducer is
CR not touching the aircraft).

CR G. Push the on/off switch of the instrument in the "OFF"
CR position. Connect the instrument power cord to the
CR instrument and to an AC power outlet (115 +/-10 VAC, 50/60
CR Hz single phase).

CR H. Push the on/off switch to the "ON" position. The display
CR will go through a digit check starting with nine through
CR zero. The display should then indicate some message. If
CR the display is too dark or too light to read, press the
CR "contrast adjust" switch and hold pressure on it until the
CR desired contrast level is obtained for best viewing. When
CR the instrument is initially turned on, the displayed numeric
CR values may be unreadable. If the unit does not respond to
CR inputs, momentarily switch the unit off and then switch it
CR back on.

CR I. Press the "LATITUDE SET" switch, the instrument will go into
CR the latitude correction mode. Press the number keys for the
CR latitude of the location you are weighing. Use 35 deg for
CR all weighings in the USA. The display will read LAT, the
CR number you entered DEG. ex: "LAT 35 DEG". If this is not
CR the number you need, press the "CLEAR" switch and reenter
CR the correct number. Then press the "ENTER" switch. The
CR number is entered into the program and the instrument will
CR go to the weighing mode.

CR J. Press the "CHANNEL SELECT" switch. The display will
CR indicate "channel message?" Press the number key of the
CR channel you wish to program which has a load transducer
CR connected to it. Then press the "ENTER" key, the display
CR will flash "capacity = Y" for about 5 seconds and then the
CR display will indicate the load on CHX or zero (the "X" being
CR the channel selected). Press the "zero" switch and the
CR weight indicated will change to zero.

CR K. Press the "CAPACITY SET" switch, the display will indicate
CR the channel you selected and the capacity program of some
CR number. The capacity programs are as follows:

CR Program No. 3 for 50,000 LB - Nose - (50K capacity load
CR transducers).

C Program No. 4 for 100,000 LB - Mains - (100K capacity load
C transducers).

C Record the position of each channel on the Aircraft Weighing
C Check List M11-00-04/-05.

C Press the number key of the program you wish to enter, this
C is determined by the capacity of the load transducer
C connected to the channel you are programming. The display
C will indicate "CH X CAPACITY X" ("X" being the channel and
C the program number that was selected). Press the "ENTER"
C switch, the capacity program number is entered into the
C instrument program and the instrument will return to the
C weight mode. A 50,000 LB transducer is used for the nose.
C Each of the mains require a 100,000 LB transducer.

C L. Repeat paragraph K for the remaining channels which are
C connected to load transducers.

C M. After the minimum two (2) hour warm up, when satisfied all
C load transducers are indicating zero (0), and the latitude
C is set, the weighing system is now ready to weigh the
C aircraft.

C N. Raise each load transducer in position under the jack point.
C The ball of the jack point must be 1-1/2 inch in diameter or
C less and centered in the load transducer load point. Jack
C aircraft until the nose cell indicates a load of
C approximately 5000 lb and each main has approximately 10,000
C lb ± 20%. Hold this preload for about two (2) minutes.

C O. Lower aircraft to ground, ensure that load cells are clear
C of aircraft. Push the channel select key, followed by:

C A numeric key 1-6 for the desired channel followed by
C "ENTER".

C The display shows "CH X = 0 lbs. If the channel does
C not show zero, press the "ZERO BUTTON".

C Check all channels being used for zero load.

C 4. Weighing

C A. Level aircraft by inflating or deflating the landing gear
C strut as required (Ref. 8-11-00).

CR B. DELETED.

C C. Extend jacks until load cells engage jack points. Proper
C alignment must be made.

C D. Jack aircraft (all positions) at an even rate, maintaining a C level attitude, until all tires clear the floor.

C E. Record weight readings obtained from each aircraft weight C reaction point, using the Aircraft Weighing Check List, C M11-08-04/-05, showing the load cell number for each C position.

C To display the weight on any channel:

C (1) Push "channel select" key, followed by:

C (2) A numeric key "1-6" for the desired channel, followed C by:

C (3) The "enter" key.

C Display shows: "Ch 4 = 9650 lbs."

C NOTE: Any channel maybe accessed, in any order, any C time during the weighing.

C F. Lower aircraft to the floor at an even rate (Ref. 7-12-00), C maintaining a level attitude, until all load cells no longer C contact jack points.

C G. Check all load cells for zero load condition, and record all C indicated loads on the Aircraft Weighing Check List C M11-08-04/-05. If the indicated load is not 0, push the C "ZERO" button after recording the displayed load. Negative C loads may have a minus (-) sign to the right of the number.

C H. Repeat Steps 4C through G. Record both sets of readings.

C I. Check the latitude setting again. If changed, repeat steps C 4C through G.

C J. Be sure to turn on/off switch to the "off" position prior to C disconnecting any cables or load cells.

WEIGHING PROCEDURE USING ELECTRONIC LOAD CELLS AT WING AND FUSELAGE JACK POINTS

1. General

The weighing kit must be warmed up before use. The aircraft and ground support equipment should attain a stabilized temperature before weighing.

2. Referenced Procedures

7-11-00	Wing and Fuselage Jacking - Maintenance Practices
8-11-00	Leveling, Plumb Bob - Maintenance Practices
8-12-00	Leveling, Spirit Level - Maintenance Practices

3. Servicing

A. Weighing

CAUTION: MAXIMUM JACK AND JACK POINT LOADS MUST NOT BE EXCEEDED DURING WEIGHING OPERATIONS.

(1) Bleed air from nose and main landing gear struts. Install strut lock assemblies to maintain strut in compressed position.

(2) Install jack adapters at primary wing and fuselage jack points.

(3) Position jacks with built-in load cells directly under wing and fuselage jack adapters (Ref. 7-11-00).

CR (4) Release brakes with wheels chocked to prevent rolling.

(5) Extend jacks until load cells engage jack adapters. Proper alignment must be made.

CR (6) Jack at an even rate (all positions), maintaining a level attitude (Ref. 8-11-00), until 500 lb reading is registered on nose gear load cell and 3000 lb is registered on each wing load cell.

(7) Stabilize the load cells by maintaining load a few minutes.

(8) Lower the aircraft until all load cells no longer contact jack adapters.

(9) Zero the electronic weighing scale, and correct any drift.

NOTE: Excessive drift after repeated preloading normally indicates a defective weighing unit.

(10) Extend jacks until load cells engage jack adapters. Proper alignment must be made.

(11) Jack at an even rate (all positions), maintaining a level attitude, until all tires clear the floor. Check
CR aircraft level attitude by plumb bob.

(12) Record weight readings obtained from each aircraft weight reaction point, using the appropriate weight form.

(13) Lower aircraft to the floor at an even rate (Ref. 7-11-00) maintaining a level attitude, until all load cells no longer contact jack adapters.

(14) Check all load cells for zero-load condition, and
CR record all drift corrections on the weighing check list
CR M11-08-04/-05.

CR (15) Repeat Steps 3A(9) through (14) if the zero set on any
CR one cell is greater than 100 pounds. Record both sets
CR of readings.